

CLAIMS

What is claimed is:

1. A surgical retractor positioning device, comprising:
 - a) a frame;
 - 5 b) an arm connected to the frame, the arm including a proximal end, a distal end having a distal end axis, and a major axis, the distal end axis being movable relative to the proximal end, whereby the distal end axis can intersect the major axis at an angle; and
 - c) at least one blade connected to the distal end of the arm, the blade being
10 fixably rotatable about the major axis.
2. The device of Claim 1, including at least two arms.
3. The device of Claim 2, wherein at least one arm is movable relative to the frame.
4. The device of Claim 2, further including a blade connected to the distal end of
15 the second arm.
5. The device of Claim 4, further including an assembly device including a rack to facilitate positioning the blades onto the arms.
6. The device of Claim 5, wherein each blade has a proximal end and a distal end, the retractor blades being suspended from the rack at the proximal end.
- 20 7. The device of Claim 2, wherein the major axes of the arms are colinear or intersect.

8. The device of Claim 7, including at least four arms, each of which having a major axis that is colinear or intersects the major axis of each of the other arms.
9. The device of Claim 8, wherein at least one arm is movable along its major axis.
10. The device of Claim 9, wherein the major axis of at least one arm can pivot
5 about a point at the frame.
11. The device of Claim 10, wherein at least one portion of the frame along which the arm is movable is arcuate.
12. The device of Claim 11, wherein the frame is substantially circular.
13. The device of Claim 11, wherein the frame is substantially elliptical.
- 10 14. The device of Claim 1, wherein the blade includes a clip for removably connecting the blade to the arm.
15. The device of Claim 1, wherein the blade is at least partially tapered from an end, which is attachable to the arm, to a working end.
16. The device of Claim 1, wherein the blade includes an outer surface that is
15 configured to prevent or minimize soft tissue slip during retraction.
17. The device of Claim 1, wherein the blade is detachable from the arm.
18. The device of Claim 1, further including a sensor at at least one blade.
19. The device of Claim 18, wherein the sensor is at least one member selected from
20 the group consisting of a pressure sensor, a thermal sensor, and a motion sensor.

20. The device of Claim 1, wherein at least one blade includes a position sensor.
21. The device of Claim 20, wherein the position sensor is at least one member selected from the group consisting of a reflective, a light-emitting, and an RF-emitting sensor.
- 5 22. The device of Claim 1, wherein the arm is controlled by a controller coupled to an actuator.
23. The device of Claim 22, further comprising one or more sensors at the arm, blade, or a combination thereof, coupled to the controller, whereby the controller controls the arm based on information provided by the one or more sensors.
- 10 24. A surgical retractor positioning device, comprising:
- a) a circular frame;
 - b) a plurality of arms connected to the frame, each arm including a proximal end, a distal end having a distal end axis being movable relative to the proximal end, and a major axis that extends between the proximal and
15 distal ends, whereby the distal end axis can intersect the major axis at an angle; and
 - c) a retractor blade connected to the distal end of each arm, each blade being fixably rotatable about the major axis.
- 20 25. The device of Claim 24, wherein each blade includes a clip for removably connecting the blade to an arm.
26. The device of Claim 24, further including a retractor blade assembly for attaching the blades to the distal end of each arm.

27. A method of forming a surgical working field in a patient, comprising the steps of:
- making an incision in a patient;
 - positioning a surgical retractor over the incision, the retractor including a plurality of blades connected to respective arms positioned on a frame, each arm including a major axis, a proximal end, and a distal end having a distal end axis, each blade being connected to the distal end, the distal end axis being movable relative to the proximal end, whereby the distal end axis can intersect the major axis at an angle, the blades being adjustable from a collapsed, reduced diameter configuration to an extended, increased diameter configuration;
 - introducing the blades in the collapsed configuration into the incision in the patient;
 - expanding the blades within the incision to the increased configuration to create the working field in the patient; and
 - rotating at least one blade relative to a major axis of an arm and affixing the blade in a desired position.
28. The method of Claim 27, wherein the steps of moving the at least one retractor blade is carried out under automated control.
29. The method of Claim 27, further comprising the step of connecting the plurality of blades to the respective arms with a rack.
30. A retractor blade assembly, comprising:
- a) a fixed rack; and
 - b) at least two retractor blades, each retractor blade having a proximal end and a distal end, the retractor blades being suspended from the rack at the proximal end.

31. The retractor blade assembly of Claim 30, further including hooks at the rack for coupling the retractor blades to the rack.
32. The retractor blade assembly of Claim 31, wherein the retractor blades include at least one clip at the proximal end and, whereby each retractor blade can be
5 affixed to a distal end of an arm of a surgical retractor.
33. The retractor blade assembly of Claim 32, wherein each hook at the rack is slidably engageable with the at least one clip of the retractor blade while the blades are suspended within the rack.
- 10 34. A method of forming a surgical working field in a patient, comprising the steps of:
making an incision in a patient;
introducing a plurality of retractor blades into the incision in the patient;
attaching the blades to a plurality of arms of a surgical retractor; and
15 removing a rack attached to the blades.
35. The method of Claim 34, further comprising positioning the surgical retractor over the incision in the patient, the retractor including the plurality of arms attached to a frame, each arm positioned to receive a retractor blade.
36. The method of Claim 35, further comprising attaching the plurality of blades to
20 the rack after the surgical retractor is positioned over the incision.
37. The method of Claim 36, further comprising expanding the frame, thereby retracting the incision with the blades to form the surgical working field in the patient.